Micrographics

Technical and Legal

Procedures

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The North Carolina Department of Cultural Resources is responsible, under General Statute 121-4, for ensuring the economical and efficient maintenance and preservation of public records created by agencies and public officials. The MICROGRAPHICS TECHNICAL AND LEGAL PROCEDURES publication has been developed to aid state, county, and municipal agencies in producing microfilm which meets the requirements of the state and federal "Uniform Photographed Copies of Business and Public Records as Evidence Act." The original technical standards for microfilm were approved by the North Carolina Historical Commission on March 31, 1980. These standards establish quality control procedures which will ensure the permanence of microfilmed records. State, county, and municipal agency-operated micrographic systems should adhere to these standards.

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INTRODUCTION

Micrographics may be defined as the processes and equipment used to film, store, and retrieve records or other information in miniature photographic form. In today's highly computerized and technology-driven office, there is still a place for micrographics. The basic principles have changed little over the last 100 years, but the marriage of micrographics and information processing equipment has enabled the user to produce microfilm /fiche, and locate data on it much more quickly.

Many times micrographics is forgotten as a viable option for retaining records. As one component of a comprehensive and active records and information management program, it provides several benefits. *Information* can be processed as Computer Output Microfilm (COM) at high speed and with low error rates. Micrographics is an effective method for vital records protection, creating security backup of irreplaceable office records which can be stored off-site. Space savings of up to 98% can be realized if microfilm/fiche is used instead of paper. These are all benefits of an active micrographics program, but the custodian of the records must realize that the *entire records keeping system* should be evaluated before expending the effort and expense to convert the information to microfilm/fiche. In other words, a micrographics program will not help a records system that is inherently faulty.

There are certain considerations which should be noted about the permanent preservation of records or other information. Records which are identified as being *permanent* in an agency's official records retention and disposition schedule should not be destroyed or otherwise disposed of unless, in some cases, they are first microfilmed. One popular desire is to scan these permanent records and store their digitized images on optical disk or CD-ROM. These media are not considered *permanent*. Microfilm, however, is when it is produced and stored according to the guidelines and procedures in this handbook. It is recommended that any custodian who plans on implementing such a scanning project first contact an analyst with the Division of Archives and History.

In summary, micrographics is still alive and well in the world of records keeping. To microfilm records or retain them in paper form is a question which cannot be answered easily. The individual case must first be analyzed and specific issues resolved. These issues include, but are not limited to, establishing reasons for microfilming the records, learning about legal and technical guidelines, deciding how long the microfilm must be kept, determining processing and storage costs, and examining retrieval equipment needs.

It is hoped that the information and standards in this revised edition of *Micrographics Technical and Legal Procedures* will be useful to anyone considering alternatives for the long-term retention of North Carolina's public records.

TECHNICAL STANDARDS FOR MICROGRAPHICS

The North Carolina Department of Cultural Resources, through the Division of Archives and History, requires that certain standards be met to assure quality microforms that are readily reproducible and, where necessary, capable of permanent preservation. These standards are based on the requirements of the American National Standards Institute (ANSI), The Association for Information and Image Management (AIIM) [formerly the National Micrographics Association (NMA)], the National Bureau of Standards (NBS), and other federal agencies.

All micrographics operations conducted by the Division of Archives and History conform to the standards for permanent microfilm. Only those products, procedures, and methods recognized within the profession as offering the highest probability of reaching these standards of quality are employed.

There are four basic groups of standards that establish criteria for microfilm to be considered permanent: the standards for the manufacture of raw film; the standards affecting the method for filming in order to produce good overall results; the standards involved in processing (developing) microfilm; and the standards for the storage of processed microfilm.

All microforms produced by agencies which are to be kept for ten years or longer should be considered as permanent and these standards applied. When adhered to, these criteria will:

1. Assure the permanence of developed film
2. Ensure that raw film will be of permanent quality
3. Give necessary detail of image
4. Produce film that can be easily read and reproduced
5. Satisfy legal requirements that the film actually contains images of all documents intended to be microfilmed

PRINCIPAL STANDARDS AFFECTING MICROFILM

The principal standards affecting microfilm, which follow, are listed by number and title. These standards should be used when establishing as well as maintaining an in-house microfilm program, when purchasing film or microfilm equipment, and when preparing a contract for services. These standards apply to silver halide film only--not to diazo, mylar, vesicular, or dry processed silver film.

Item 1. STANDARDS FOR THE MANUFACTURE OF RAW MICROFILM

Raw film purchased for permanent use (to be retained ten years or more) must meet the following standards:

- ANSI IT9.6-1991 (R1996) *Photographic Films - Specifications for safety film*
- ANSI/NAPM IT9.1-1996 *Imaging Media (Film) - Silver-Gelatin Type - Specifications for Stability.*

These standards relate to both the film's base material and emulsion. When purchasing raw film, cite these standards as specifications in a purchase order or contract.

Item 2. STANDARDS AFFECTING THE METHOD OF FILMING TO PRODUCE GOOD OVERALL RESULTS

The following standards are to be used when filming permanent records:

- ANSI/AIIM MS14-1988 *Specifications for 16mm and 35 mm Roll Microfilm*
- ANSI/AIIM MS23-1998 *Practice for Operational Procedures/Inspection and Quality Control of First-generation, Silver Microfilm of Documents*

Resolution

Resolution is the ability of a photographic system to record fine detail; a measure of sharpness of an image, expressed as the number of lines per millimeter, discernible in an image.

The procedure to determing resolution is the RESOLUTION TEST. In processed microfilm, resolution is a function of film emulsion, exposure, camera, lens, camera adjustment, camera vibration, and film processing.

The resolution standard for roll film is contained in the International Standard ISO 3334-1991(E) "*Micrographics - ISO resolution test chart No. 2 - Description and use*" and for microfiche in ANSI/AIIM MS5-1992 (R1998) - *Microfiche*.

Resolution is expressed in terms of number of lines per millimeter and is measured by examining a microfilmed image of the Resolution Test Chart (Figure 1) under a microscope (of 100X power) to determine the smallest pattern in which lines can be distinguished both horizontally and vertically. These patterns consist of five groups of lines, each of which are arranged on a chart and filmed at the start and end of a roll of film. An *original chart* (not a copy) must be used for the measurements to be accurate.

The smallest line pattern in which lines can be distinguished in both directions establishes the resolving power of the system.

The following chart shows the results of multiplying the Reduction Ratio and the smallest Test pattern which has lines that are distinguished vertically and horizontally.

Reduction Ratio	Smallest ISO Test Chart 2 pattern read	Resolving Power (*line pairs per mm)*
12:1	9.0	108
16:1	7.1	114
20:1	5.6	112
21:1	5.6	117
24:1	5.0	120
28:1	4.5	126
30:1	4.5	135
36:1	4.0	144
40:1	3.2	128

Resolving power is affected by any or all of the following:

- Film type (the finer the film grain, the higher the potential resolving power)
- Camera Lens
- Maintenance of lens (free of smudges or dirt, focus, etc.)
- Camera vibration

Quality Index

QUALITY INDEX is the method to determine the legibility of the final distribution microfilm image. This procedure is to be performed before a microfilming project is begun. The evaluation is based on the height of the smallest pertinent letter (usually the lower case "e") in a good contrast document. It is not necessary to apply this method to text characters if the information they give is repetitive. The height of the character is measured in millimeters. Also included is the evaluation of the cameras resolving power at the specific reduction ratio the documents will be filmed at. This procedure is discussed in detail in ANSI/AIIM MS23-1998 P*ractice for operational Procedures/Inspection and Quality Control of First-generation, Silver Microfilm of Documents.*

Density

Density is the light absorbing quality of the photographic image or the degree of contrast between the image and non-image background.

The standard which establishes the requirements for the acceptable density of microfilm is known as the DENSITY TEST. It is contained in ANSI/AIIM MS23-1998.

The degree of background density is measured by an instrument called a densitometer. The density patch should be filmed using a sheet of clean white bond paper or white card stock. This image is used to determine the density created by the camera setting and calibration with the processor. Density is the one critical factor most subject to change, and it must be watched very closely. Excessive light causes the image to be dark or overexposed, and insufficient light causes the image to be light or underexposed. Processing also affects the density of microfilm.

Density is affected by:

- Variations in film emulsion
- Use of expired film
- Line voltage changes
- Lamp aging
- Dirty mirrors and glass guides in rotary cameras
- Temperature variations and speed changes in the processing of film
- Age of chemicals used during processing
- Changes in ambient or overhead light conditions when using a planetary camera
- Latent image fade

There are several important density terms. The maximum density is D-max, while the minimum density is D-min. Background density is the source document's background on the imaged film. Delta density (▲D) is the difference in density between two imaged areas on film and is often the difference between the D-max and D-min. The concept of delta density is important since there must be sufficient difference in density between the dark and light areas on the original document for good reproduction. The film copy also must have sufficient (▲D) for reading and copying. Density control is extremely important in producing good quality microfilm.

Due to limitations in most photographic systems, thin lines in the original documents will tend to fill in when filmed as a function of their width and density. Therefore, as the reduction ratio of a given system is increased, it may be necessary to reduce the background density to achieve an image with relatively low line density so the copies will contain legible characters.

Sometimes an exposure series should be made of selected documents to obtain appropriate background density as recommended by groups 1 to 5.

Group 1. High-quality, high-contrast printed books, periodicals, and black type. Density of 1.30 to 1.50.

Group 2. Fine line originals, black opaque pencil writing and documents with small, high-contrast print. Density of 1.15 to 1.40.

Group 3. Pencil and ink drawings, faded printing and very small printing, such as the footnotes at the bottom of a printed page. Density of 1.00 to 1.20

Group 4. Low-contrast manuscripts and drawings; graph paper with pale, fine-colored lines; letters typed with a worn ribbon; and poorly printed, faint documents. Density of 0.80 to 1.00.

Group 5. Although not a general practice, some poor-contrast documents may require a background density of 0.70 to 0.85 to enhance image quality.

The base-plus-fog density of the unexposed, processed, clear-base film should not exceed 0.10. When a tinted base film or thermally-processed silver film is used, the density will increase by 0.10 to 0.20, which must be added to the 0.10 value.

The ultimate density criteria are for the microfilm to be legible for its intended use (reading, duplicating or printing hard-copies) and for all images in a roll to be duplicated at the same duplicator exposure.

Item 3. RECOMMENDED PROCEDURES FOR PROCESSING MICROFILM

The following principal procedures are for processing microfilm. These procedures should be used when establishing and maintaining a microfilm processing lab or be specified in contract with a vendor. ANSI/AIIM MS23-1998 *Practice for Operational Procedures/Inspection and Quality Control of First-generation, Silver Microfilm of Documents* - covers topics such as deciding whether to use a vendor or processing film in-house. This standard also covers points to consider when choosing a processor.

Processing of silver halide microfilm should conform to relevant standards AIIM/ANSI MS23-1998. Standard tests should be performed by the processing operator to confirm that the film processor is properly calibrated and the chemicals are properly mixed. This is accomplished by running a “control strip” of film through the processor, before running any camera film, to ensure that the desired density is achieved. This will help to ensure that optimum density and contrast has been achieved and that the chemical processing has been properly completed.

Processor Control

The basic function of the processor is to transport the film through the various solutions and to permit an appropriate treatment time for the film in each bath. There are a number of factors that influence the outcome of film processing:

a) Temperature - Fluctuations in temperature will cause density readings to increase or decrease depending on the extremes of the change.
b) Machine Speed - For even processing and consistent results, the processor film speed must remain the same throughout the roll.
c) Agitation and Replenishment - To keep developer and fixer most effective, you must ensure proper agitation and replenishment.
d) Filtration of Wash Water and Processing Solutions - Regularly check water and chemical filters and change when needed.
e) Film Drying - Control of both temperature and humidity is essential for obtaining desired physical properties. Insufficient drying causes film to be too tacky; over-drying will result in excessive curl and brittleness.

The processor should wash the film thoroughly to meet archival standards. The test which establishes the amount of residual thiosulfate remaining on the surface of microfilm after the final wash is commonly known as the RESIDUAL THIOSULFATE TEST, or METHYLENE BLUE TEST. It is contained in the ANSI/NAPM IT9.17-1993 standard: *Photography - Determination of Residual Thiosulfate and Other Related Chemicals in Processed Photographic Materials - Methods Using Iodine-Amylose, Methylene Blue and Silver Sulfide*. ANSI/NAPM IT9.1-1996, *for imaging media (Film) - Silver-Gelatin Type - Specifications for Stability.* This standard specifies a maximum of 1.4 micrograms per square centimeter of the thiosulfate ion.

Adequate washing is essential to permanence of microfilm. After all of the underdeveloped silver halide has been converted, the emulsion is still saturated with the chemicals of the fixing bath and some dissolved silver compounds. If these are not removed by washing, they will slowly decompose and attack the image, causing discoloration and fading. Also, the smaller the grain size of the image, the greater the reaction. Since most microfilm is composed of very fine grains, it is very sensitive to this effect.

Testing should be conducted regularly for excessive and damaging amounts of sodium thiosulfate remaining on the surface of microfilm after final wash. Film processed in-house should be tested and certified once a week. Processing services off-site should include provisions requiring that the methylene blue test be performed every 24 hours. As with all quality control records, the methylene blue test results should be recorded and maintained.

Environmental Concerns

A processing lab must also consider how it will dispose of fixer. AIIM TR04-1989(A1993) - *Silver Recovery Techniques* describes photographic silver recovery and the processes involved. ANSI/AIIM TR20 - 1994 *Environmental Right-to-Know Regulations Affecting Microfilm Processors* addresses laws and regulations that control photo processing wastewater discharges, regulate hazardous material storage and disposal, protect communities from hazardous chemicals, and provide protection to employees exposed to hazardous substances. The intent of this publication is to review

the federal requirements of these regulations. Silver recovery can be attempted in-house or contracted out. Unprocessed and processed microfilm should be disposed of through a commercial recycling company which will recover silver from the film before disposing of the base material.

Standards Involved in Testing the Results of Film Processing

The following standards or technical reports apply:

ANSI/NAPM IT9.17-1993	*Photography - Determination of Residual Thiosulfate and Other Related Chemicals in Processed Photographic Materials - Methods Using Iodine-Amylose, Methylene Blue and Silver Sulfide*
AIIM TR4-1989	*Silver Recovery Techniques*
ANSI/AIIM TR20-1994	*Environmental and Right-to-Know Regulations Affecting Microfilm Processors*
ANSI/AIIM MS23-1998 *and*	*Practice for Operational Procedures/Inspection Quality Control of First-generation, Silver Microfilm of Documents*

Item 4. STANDARDS AFFECTING THE STORAGE OF PROCESSED MICROFILM

Microfilm Storage

Standards also apply to the storing of permanent silver halide microfilm. It is extremely important that the required storage conditions be followed for this type of film.

ANSI standard IT9.2-1998 *for Imaging Media - Photographic Processed Films, Plates, and Papers - Filing Enclosures and Storage Containers*, requires that materials such as plastic which are used for reels to be free of peroxides. Do not use rubber bands to hold film onto reels. If paper bands are used they must be free of acid which is harmful to silver based film. Silver based microfilm must not be stored with other types of microfilm such as diazo or vesicular microfilm because possible contamination may occur. Film should be stored in closed containers that are composed of non-corrosive material such as anodized aluminum, stainless steel, peroxide free plastics, or acid and lignin free cardboard.

ANSI standard IT9.11-1993, *for Imaging Media - Processed Safety Photographic Film - Storage*. Environmental conditions for the storage of permanent microfilm include the following:

> Temperature - Temperatures shall not exceed 21° C (70° F). Lower temperatures are recommended for added protection.

Humidity - Relative humidity should be around 30% and shall not exceed 40%. Rapid and wide range cycling of humidity and temperature is to be avoided (not to exceed ± 5° temperature range in a 24-hour period).

Air Purity - Mechanical filters should remove any solid particles from the air that may abrade or react with the film image. Gaseous impurities such as sulfur dioxide, hydrogen sulfide, peroxides, etc., should be removed from the air since they can cause deterioration in the film base.

Microfilm Inspection

At approximately two year intervals, a one percent sample of randomly selected rolls of microfilm should be inspected. For each two-year inspection, a different lot sample should be chosen, allowing some over-lapping to note any changes in previously inspected samples. The film should be inspected for mold or fungus, excessive brittleness, film curl or discoloration, excessive scratches, and the presence of redox blemishes.

Acetate film, which can chemically decompose and give of acids, is to be tested for vinegar syndrome. Vinegar syndrome is a slow form of chemical deterioration. As this film degrades it gradually shrinks and becomes brittle. The decomposition also produces a sharp vinegar odor which indicates the presence of acetic acid.

If permanent film shows any of these problems, a silver duplicate should be made to replace the original reel. Refer to ANSI standard MS45-1990, *Recommended Practice for Inspection of Stored Silver-Gelatin Microforms for Evidence of Deterioration* for more information.

Item 5 CARE AND HANDLING OF ACTIVE MICROFORM FILES USED AS REFERENCE COPIES

You can find general guidance for the storage, care, handling, and use of microforms in an active or working environment in ANSI/AIIM TR13-*1998 Preservation of Microforms in an Active Environment – Guidelines*. All currently available microfilm types are briefly discussed and some general guidelines are provided for the use and care of readers and reader-printers.

Microfilm Handling

When handling microfilm, only touch non-image areas. Fingerprints contain oils and acids that, over time, have a damaging effect on the filmed image. You can minimize the chance of damage by wearing clean white gloves when touching film. If it is necessary to handle film without gloves, be sure your hands are clean and free of hand lotions and only touch the film on the edges.

Keeping microfilm readers clean is a primary requirement in the maintenance of this type of equipment. A dirty reader will scratch the film as it passes through the film guides. You will see improved quality in the viewer and prints when lenses, mirrors, and screens are cleaned regularly.

Storage Recommendations
Proper storage will ensure longer lasting film. Active microform files should meet medium-term storage conditions to ensure a minimum life of 10 years. Storage requirements can be found in standard ANSI IT9.11-1993 - *for Imaging Media - Processed Safety Photographic Film - Storage.*

Microforms should never be stored near heat or exposed to excessive light. All microforms should be stored in containers such as envelopes or boxes, and these containers should be stored in trays or cabinets. As a general rule, reference copy microfilm should be stored in closed containers in an air conditioned environment.

SOURCES FOR SPECIFICATIONS AND STANDARDS

Microfilm standards and specifications named in this publication may be purchased from the following sources:

American National Standards Institute
Standards Sales
1430 Broadway
New York, New York 10018
(212) 354-3473

Association for Information and Image Management
Publications Sales
1100 Wayne Avenue
Silver Spring, Maryland 20910
(301) 587-8202

Association of Records Managers and Administrators
4200 Somerset, Suite 215
Prairie Village, KS 66208
(913) 341-3808

WHY CERTIFICATION AND IDENTIFICATION OF MICROFILM IS NECESSARY

The "Uniform Photographic Copies of Business and Public Records as Evidence Act," Federal Public Law 129, section 1732, and chapters 8-45.1 and 153A-436 of the General Statutes of North Carolina, provide for the acceptance of microfilmed records of county, municipal, and state offices in both federal and state courts. However, there are three

basic requirements established by these laws which must be satisfied in order for the microfilmed record to be as admissible in evidence as the original paper record: the microform must be produced in the regular course of business, the microfilm should accurately reproduce to form a durable medium for duplicating the original, and the microfilm must be satisfactorily identified.

To ensure that the foregoing criteria for legally acceptable microforms are met, the Division of Archives and History, Department of Cultural Resources, has prepared forms, targets, and procedures to be used when microfilming public records. Technical standards which will ensure that records are correctly microfilmed and will form a durable medium for reproducing the original paper record also have been written. All have been consolidated in this publication with additional technical and professional advice that will accomplish these purposes when followed.

Every office or agency operating a microfilm system should have written policies and procedures governing the microfilming, certification, and identification of their records. Policies and procedures concerning the destruction of paper records after microfilming and inspection of the final product should be included. Particular attention should be given to the selection of a method of destroying records that have been microfilmed as well as extra care to ensure the paper records once microfilmed are authorized by the Department of Cultural Resources to be destroyed. Under no circumstances should records designated as permanent in an official records retention and disposition schedule be destroyed, even though they have been microfilmed, without the approval of the Department of Cultural Resources. For further information regarding destruction and approval procedures, please consult G.S. 121 and G.S. 132 and your agency's records retention and disposition schedule.

Microfilm security copies of records which do not conform to these procedures are nonstandard and do not properly protect or preserve records of permanent value.

Item 6. PROCEDURES FOR FILMING A ROLL OF MICROFILM

The following procedures should be followed in preparing each roll of microfilm to properly certify and clearly identify the documents being filmed. It should be noted that the Resolution Test Chart and Density Target are not part of the certification and identification material and are filmed before the Start Target.

The suggested order of targets for roll film systems is:

a) White bond paper or card stock (to record density)
b) Technical Target (to read and record resolution, Figure 1))
c) Start Target-denotes the beginning of the roll. (Figure 2)
d) Agency or Department Seal Target-show by whom and where the records were filmed. (Figure 3)
e) Reel Number Target-provides permanent identification of that reel. (Figure 4)

f) Explanatory Target-contains special explanatory material or information concerning the arrangement or description of the records, as appropriate. (Figure 5)
g) Certificate of Authenticity-filled in to show whose records are being filmed, what the records consist of, what the records begin with, date filming began, and reduction ratio. The certificate is **NOT** signed at this time. (Figure 6)
h) Documents to be filmed.
i) Certificate of Authenticity-completed by entering: ends with, date filming ended, and signature of the camera operator. Film after the last document. (Figure 6)
j) End of Book (Figure 7)-used only when books or volumes are filmed.
k) End of Reel Target-the last item to be filmed on the reel. (Figure 8)

ANSI/AIIM standard MS14-1988 *Specifications for 16mm and 35mm roll microfilm,* covers physical characteristics, formats, placement and orientation for microfilming records. When filming to microfiche also refer to ANSI/AIIM MS5-1992 (R1998) *Microfiche*.

Item 7. PROCEDURES FOR JACKETING MICROFILM

Certification should be completed for all microfilmed records. When the microfilmed records are jacketed, the first image inserted into the jacket should be the Certificate of Authenticity. When several case records are filmed on a roll of film that is to be jacketed, a Certificate of Authenticity should be filmed at the beginning of each case. All entries should be recorded in the microfilmer's records log to ensure acceptability of the filmed cases as evidence during future references or legal actions. Each Certificate of Authenticity should include the complete title and the location of the department or agency, the complete title of the program, the reduction ratio used, and the camera operator's signature. Each time a jacket is updated an entry should be made in the microfilmer's records log. (Figure 13)

Item 8. PROCEDURES FOR CORRECTING ERRORS DETECTED WHILE FILMING

Errors made during filming, such as two documents microfilmed together or a document microfilmed with a corner fold or a crease, are corrected by filming a Correction Target (Figure 9) and then refilming the documents. The microfilm camera operator should advance the film and continue filming. Where there is doubt in the operator's mind as to whether or not an error has been made, it is better to refilm the documents in question using this procedure than to wait and make the correction later.

Item 9. PROCEDURES FOR PROOFREADING AND LISTING ERRORS

Some errors are detected while documents are being filmed, and others are not found until the film is proofread.

Undetected errors made while filming are corrected after the film has been processed (developed), inspected and proofread on a microfilm reader, image-by-image. It is recommended that a person who did not film the reel proofread the roll.

In proofreading the film, particular care should be taken to detect double feeds, turned down corners which obliterate vital parts of the document, fogged or blurred images, and any other defects which will prevent or impair the use of the film. In all such cases, the error or unsatisfactory image or images should be refilmed. The retake, after processing (developing), inspecting, and proofreading, should be spliced into the film sequence where the error appeared. Another technique is to splice the correction after the End of Reel Target. See the section on Procedures for Splicing Retakes.

While proofreading the film, each error should be listed on an error sheet with sufficient information to enable another person to locate the original document for refilming. An error sheet(s) should be established for each project and should include:

a) The name of the project.
b) The reel number.
c) Sufficient information to enable a person to identify the document(s) which is to be refilmed.
d) Voucher numbers, county names or any other identifying information, if any, should be noted. If supporting data is included, there should be sufficient information to enable a person to know just what and how much material is to be refilmed.
e) The nature of the error. The type of error should be indicated, such as an overlap, a turned down corner, a blurred image, a machine error, etc.
f) The date the microfilm is spliced and the name of the individual who spliced the correction retakes.

Item 10. PROCEDURE FOR FILMING RETAKES

In making the correction retakes, the microfilm camera operator should carry out the following sequence of operation:

1. Film Start of Retake Target (Figure 10). Advance the film for three seconds on a rotary camera; do not advance the film on a planetary camera.
2. Film Splicing Authenticity Certificate (Figure 11) with all entries completed EXCEPT the ending and the microfilm camera operator's signature. Do not advance the film between the certificate and the first image of the retake.
3. Film the unsatisfactory document(s) plus additional documents on either side of the error as follows (do <u>not</u> advance the film after the final document is filmed):
    a) 35mm film-one document preceding and one document following the error.
    b) 16mm film simplex 24:1 or 32:1 -- two documents preceding and two documents following the error.
    c) 16mm film duplex 32:1 or 40:1 letter size documents -- no additional documents.

d) 16mm film duplex 32:1 or 40:1 -- small documents such as checks and tabulation cards, four images following the error.

4. Film Splicing Authenticity Certificate (Figure 11) with the "ending with" blank line completed and signature of the camera operator entered.
5. Advance the film and film End of Retake Target (Figure 12) and advance the film again.
6. If there is more than one retake on a single roll of film, repeat the entire procedure as outlined above, leaving sufficient space between retakes to allow for splicing.

Item 11. PROCEDURES FOR SPLICING RETAKES

All persons splicing film should wear clean white gloves and handle film by the edges only. ANSI/AIIM MS18 - 1992 - *Micrographics-Splices for Imaged Microfilm - Dimensions and Operational Constraints* recommends no more than 6 splices within the image area of each roll of film. This is especially important for permanent microfilm. The following procedures for splicing film should be followed:

a) If a single image is to be replaced, cut it down the middle; if more than one image is to be replaced, cut the first and last images down the middle and discard film between cuts. This procedure provides enough film for splicing the retake.
b) On 35mm film, the images immediately before and after the cut should be duplicated on the retake.
c) On 16mm film the images (two before and two after the cut) should duplicated on the retake.
d) Each retake should contain a Splicing Authenticity Certificate (Figure 10) at the beginning and end of the documents.
e) On 16mm and 35mm film an addition is spliced at the end of the reel.

Improper splicing can result in numerous difficulties when duplicating or using on microfilm readers or reader-printers. ANSI/AIIM MS18-1992 discusses splicing recommendations. Heat weld splices are recommended for triacetate based film and ultrasonic splices are recommended for polyester based film. It is not recommened that splicing tape be used. If it is, the adhesive is to be formulated as not to be injurious to the long term keeping qualities of the film, and the adhesive will not migrate from under the splice.

Item 12. EXAMPLES OF ERRORS

AIIM/ANSI standard MS23-1998 *Practice for Operational Procedures/Inspection and Quality Control of First-generation, Silver Microfilm of Documents* details filming errors with descriptions and examples. Some examples of errors frequently detected are listed below:

Folded documents: If a number, name, or any vital information is covered, the document must be refilmed. If the fold merely covers a portion of printed matter which is

standard on every similar document, it is not necessary to refilm the document. Endorsements on checks should be clearly visible. If a turned down corner obliterates even a portion of one letter of a signature, the check or any other document should be refilmed.

Overlaps: If the edge of one document is overlapped with the edge of another, and none of the information is covered, there is no error. If any information is hidden from view, there is an error, and the document should be refilmed.

Splotches: Any splotch which obliterates part of the information on a document is an error. If there are splotches throughout a roll of film, there is a possibility that they can be removed by rewashing the film.

Scratches: Scratches occur in the form of irregular contour or straight lines and may be the result of faulty equipment (camera and/or processor). If a scratch obliterates part of a document, the document should be refilmed. If there are scratches throughout a roll of film, unless the material cannot be read, it is not practical to consider every document which is scratched as an error. Sometimes the cause of the scratches must be determined by examining both the camera and the processor.

Fog: Fog may appear along the edges or throughout the entire reel. If edge fog blots out information, the documents should be counted as errors and refilmed. If fog appears throughout the reel, the entire reel should be refilmed.

Blurs: Images which are blurred are considered errors and should be refilmed

"Stretched" Material: Any material which is stretched or appears to be pulled out of shape should be refilmed.

Static Marks: Static marks are exposed looking spots, streaks or tree-like forms. They are caused by the discharge of static electricity. Images affected by this problem are to be refilmed if the information of that document is illegible.

Over or Under Exposure: Overexposure produces filmed images that are too dark, and underexposure produces images that are too light. Images not meeting the selected limits are to be refilmed.

Over or Under Development: Over development causes density to rise; under development causes it to drop. If the density does not fall into the required limits, the images (or entire roll) shall be refilmed.